CLAIMS

1. An apparatus for detection of radiation comprising:

- a photocathode layer adapted to release photoelectrons in dependence on incident radiation;

- a radiation entrance arranged such that a beam of radiation can be entered into the apparatus through said radiation entrance and can impinge on said photocathode layer at grazing incidence;

- an electron avalanche amplifier adapted to avalanche amplify photoelectrons released from said photocathode layer; and

- a readout arrangement adapted to detect avalanche amplified electrons from said amplifier.

2. The apparatus as claimed in Claim 1 wherein the radiation entrance is arranged such that the beam of radiation can impinge on a first surface of the photocathode layer; and said photocathode layer is adapted to release photoelectrons from said first surface, in dependence thereon.

3. The apparatus as claimed in Claim 1 wherein the radiation entrance is arranged such that the beam of radiation can impinge on a first surface, a back surface, of the photocathode layer; and said photocathode layer is adapted to release photoelectrons from a second surface, a front surface, in dependence thereon, said first and second surfaces being opposite to each other.

4. The apparatus as claimed in Claim 1 wherein the photocathode layer is 0.00001-0.1 mm thick.

5. The apparatus as claimed in Claim 1 wherein the photocathode layer is of a material having a work function, which is lower than the photon energy of said radiation beam.

6. The apparatus as claimed in Claim 1 wherein the photocathode layer is of CsI or an earth metal.

7. The apparatus as claimed in Claim 1 wherein the photocathode layer is provided with a protective layer, said protective layer being transparent to electrons; and the photocathode layer is adapted to release photoelectrons through said protective layer.

8. The apparatus as claimed in Claim 7 wherein the protective layer is opaque to light.

9. The apparatus as claimed in Claim 8 wherein the protective layer is provided with a thin, preferably metallic, layer, which is transparent to electrons and opaque to light.

10. The apparatus as claimed in Claims 7 wherein the protective layer is transparent to said radiation beam.

11. The apparatus as claimed in Claim 1 wherein the radiation entrance is arranged such that the beam of radiation can be entered into the apparatus and can impinge on said photocathode layer at a grazing angle α, which is lower than 500 mrad, preferably in the interval 0.05-500 mrad, and more preferably in the interval 0.50-50 mrad.

12. The apparatus as claimed in Claim 1 wherein the radiation entrance is provided with a window, which is transparent to said radiation beam.

13. The apparatus as claimed in Claim 1 comprising a collimator arranged in front of said radiation entrance.

14. The apparatus as claimed in Claim 1 wherein the electron avalanche amplifier includes an array of avalanche amplification regions filled with an avalanche amplification medium.

15. The apparatus as claimed in Claim 14 wherein the avalanche amplification medium is a gas or a gas mixture.

16. The apparatus as claimed in Claim 14 wherein the avalanche amplification medium is a liquid.

17. The apparatus as claimed in Claim 14 wherein the avalanche amplification medium is a solid.

18. The apparatus as claimed in Claim 14 wherein the individual avalanche amplification regions are separated from each other by a dielectric.

19. The apparatus as claimed in Claim 1 wherein the electron avalanche amplifier includes an avalanche cathode and an avalanche anode arrangement, respectively.

20. The apparatus as claimed in Claim 19 wherein the avalanche cathode is permeable to electrons.

21. The apparatus as claimed in Claim 19 wherein the avalanche anode and readout arrangements are comprised of a single arrangement.

22. The apparatus as claimed in Claim 1 wherein the readout arrangement includes an array of readout elements.

23. The apparatus as claimed in Claim 1 wherein the radiation entrance is arranged such that a planar radiation beam can be entered into the apparatus through said radiation entrance and can impinge on said photocathode layer at grazing incidence; and the read-out arrangement is arranged such that electron avalanches derivable mainly from absorption of transversely separated portions of said planar radiation beam are separately detectable.

24. An arrangement for use in planar beam radiography, said arrangement comprising an X-ray source, means for forming an essentially planar X-ray beam located between said X-ray source and an object to be imaged, and the detector as claimed in Claim

1 located and arranged for detection of the planar X-ray beam as transmitted through or reflected off said object.

25. A method for detection of radiation in a detector apparatus comprising a radiation entrance, a photocathode layer, an electron avalanche amplifier, and a readout arrangement, said method comprising the steps of:

- introducing a beam of radiation into the detector apparatus through said radiation entrance such that said radiation beam impinges on said photocathode layer at grazing incidence;

- releasing photoelectrons in dependence on said incident radiation beam by means of said photocathode layer;

- avalanche amplifying the photoelectrons released from said photocathode layer by means of said electron avalanche amplifier; and

- detecting the avalanche amplified electrons by means of a readout arrangement.

26. The method as claimed in Claim 25 wherein the photoelectrons are released from a first surface of said photocathode layer, in dependence on the radiation beam impinging on said first surface.

27. The method as claimed in Claim 25 wherein the photoelectrons are released from a first surface, a front surface, of said photocathode layer, in dependence on the radiation beam impinging on a second surface, a back surface, of said photocathode layer, said first and second surfaces being opposite to each other.

28. The method as claimed in Claim 25 wherein the introduced radiation beam comprises photons having a photon energy, which is higher than the work function of the photocathode layer.

29. The method as claimed in Claim 25 wherein the beam of radiation is introduced such that it impinges on said photocathode layer at a grazing angle α, which is lower than 500 mrad, preferably in the interval 0.05-500 mrad, and more preferably in the interval 0.50-50 mrad.

30. The method as claimed in Claim 25 wherein the photoelectrons are avalanche amplified in an array of avalanche amplification regions filled with an avalanche amplification medium, preferably an ionizable substance such as a gas or a gas mixture.

31. The method as claimed in Claim 25 wherein a planar radiation beam is introduced into the apparatus through said radiation entrance such that it impinges on said photocathode layer at grazing incidence; and electron avalanches derivable mainly from absorption of transversely separated portions of said planar radiation beam are separately detected by means of said read-out arrangement.